UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
Science and Ecosystem Support Division
Enforcement and Investigations Branch
980 College Station Road
Athens, Georgia 30605-2720

January 10, 2013

4SESD-EIB

MEMORANDUM

SUBJECT: Barite Hill 2012 4th qtr Monitoring Well Sampling Elevation Survey
QAPP transmittal
Mccormick, South Carolina
SESD Project No. 13-0088 / 13-0184

FROM: Brian Striggow, Environmental Engineer
Superfund and Air Section

THRU: Laura Ackerman, Chief
Superfund and Air Section

TO: Candice Jackson, Remedial Project Manager
Superfund Division

The attached Quality Assurance Project Plan (QAPP) describes the work to be performed in surveying the elevations of monitoring wells at the Barite Hill Site scheduled for the month of February 2013. If you have any questions or comments, please feel free to contact me at (706) 355-8619 or email striggow.brian@epa.gov .

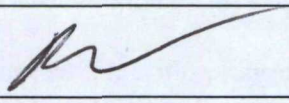
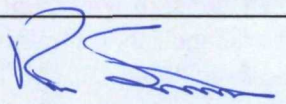
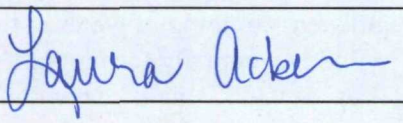
cc:
Jim Eldridge, Black&Veatch

Attachment

Quality Assurance Project Plan
U.S. Environmental Protection Agency

Science and Ecosystem Support Division
980 College Station Road
Athens, GA 30605

SESD Project ID No.: 13-0088 / 13-0184
SESD Category 2 QAPP

SECTION A: Project Planning Elements		
A1. Title (*Project Name*):	Barite Hill 2012 4th qtr Monitoring Well Sampling Elevation Survey	
Project Location:	Nevada Goldfields/Barite Hill Site, McCormick, South Carolina	
Project Requestor and Organization:	Candice Teichert, Remedial Project Manager USEPA Superfund Division 61 Forsyth Street Atlanta, Georgia 30303	
Project Leader's Name, Position and Organization:	Brian Striggow, Environmental Engineer USEPA Region 4 Science and Ecosystem Support Division Superfund and Air Section	
Project Leader's Signature:		Date: 1-10-13
Technical Reviewer's Name and Position:	Kevin Simmons Environmental Scientist	
Technical Reviewer's Signature:		Date: 1/10/13
Section Chief's Name and Position:	Laura Ackerman Chief, Superfund and Air Section	
Section Chief's Signature:		Date: 01/10/13
A2. Table of Contents	na	
A3. Distribution List	Candice Teichert Jim Eldridge, Black&Veatch	
A4. Project Personnel	**Organization**	**Responsibilities**
Brian Striggow	USEPA	Project Leader, SSO
Stephen Camp	ESAT, ILS	Survey technician
Comments: All personnel to have requisite OSHA training.		

SESDFORM-012-R7

A5. Problem Definition (Investigation Objectives and Background Information):	This project is intended to provide additional groundwater data to an ongoing Remedial Investigation at the Nevada Goldfields/Barite Hill Superfund Site. Black & Veatch and the United States Environmental Protection Agency (USEPA) Science and Ecosystem Support Division (SESD) are working cooperatively on the Remedial Investigation, with SESD performing most field work. Black & Veatch has prepared a Sampling and Analysis Plan for the Remedial Investigation, and recently an addendum to said plan which specifies work described herein. This Quality Assurance Project Plan contributes additional detail on sampling processes and procedures. The site background information below is excerpted primarily from: Barite Hill/Nevada Goldfields Sampling and Analysis Plan – Addendum 1 Revision 1, September 2012 Black & Veatch Project No.: 049038.01.01 The Site is a former gold and silver mining facility located in McCormick County, South Carolina approximately three miles southwest of the town of McCormick. The property covers approximately 795 acres, of which about 135 acres has been disturbed by historic and modern mining. The Site, which was most recently operated from about 1991 to 1995, was partially reclaimed prior to being abandoned by the operator in 1999. The Barite Hill mine was operated historically through underground workings and more recently as an open-pit and cyanide heap leach facility. When the mine was abandoned, pumping of water in the Main Pit ceased and the pit began to flood, eventually forming an acidic lake approximately 10 acres in size. By 2007, the lake contained approximately 100 million gallons of water with a hydrogen ion concentration (pH) of between 2 and 2.2 and elevated concentrations of dissolved metals. For example, the concentrations of cadmium, copper, and zinc in the Main Pit Lake were 1.57, 287, and 40.2 mg/L, respectively. The U.S. Environmental Protection Agency (EPA) initiated a time-critical removal action in 2008. This action included treating the pit water to near neutral pH, grading and covering waste rock dumps that were a major source of acidity to the Main Pit Lake and constructing a spillway to control releases to the northern unnamed tributary of Hawe Creek. Seeps from the Main Pit Lake containing acidic water with high dissolved metal content continue to

	discharge to the northern unnamed tributary of Hawe Creek, while waste rock dumps surrounding the eastern and southeastern portions of the Main Pit Lake continue to be a source of acid rock drainage. A full description of the operational and regulatory history of the Site was provided in the April 2011 SAP (Black & Veatch, 2011). The Site was placed on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) on April 9, 2009 (EPA, 2010a), and several environmental studies have been conducted on the Site related to actions pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA Region 4, Waste Management Division, Superfund Remedial & Site Evaluation Branch began a Remedial Investigation (RI)/Feasibility Study (FS) of the Site in 2010. A Work Plan for the site investigation was approved in August 2010 (Black &Veatch, 2010), and a Site-wide SAP that included a Field Sampling Plan (FSP) and accompanying Quality Assurance Project Plan (QAPP) was developed by Black & Veatch (Black & Veatch, 2011) for the RI/FS. EPA Science and Ecosystems Support Division (SESD), Athens, Georgia was tasked to lead the field investigations with Black & Veatch support. A series of QAPPs were developed by SESD that paralleled the overall SAP. The SESD QAPPs included sampling of soil, mining-related wastes, surface water, sediment, and groundwater in existing monitoring and potable wells. There are 35 monitoring wells at the Site of which 31 were installed during the late 1980s and early 1990s around the perimeter of mine facilities. The remaining four wells (BH26, BH27, BH28, and BH29) were installed by EPA in 2009 adjacent to the Main Pit Lake in a graded and covered waste rock dump. Four quarterly rounds of sampling were completed in 2011. Analytical data from the first two of rounds (February and May 2011) indicate that, with the exception of wells near the Main Pit Lake, contaminant concentrations did not exceed MCLs in any samples collected from perimeter wells. Cobalt exceeded the EPA human health regional screening level (RSL) in four wells. The RSL for manganese was exceeded in three wells, and the RSLs for cadmium and mercury were exceeded in well BH54 (Figure 3-3). Wells adjacent to the Main Pit Lake (BH26, BH27, BH28, BH29, BH55, and BH56) are highly contaminated and their chemistries are similar to water emanating from

	seeps. The seep areas appear to be related to the faults and fractures associated with the mineralized zones that were also mined from the pit. Recent electrical resistivity imaging (ERI) along the west side of the main pit lake also suggests fractures and potential leachate zones. The former Rainsford Pit was backfilled primarily with waste rock and a clay cap was constructed over the material. A recent ERI investigation of this pit area identified a high-conductivity area consistent with a potential plume of leachate immediately southeast and outside of the pit wall. This plume is suspected to be acid mine drainage (AMD). There are no monitoring wells south or southeast of the Rainsford pit and groundwater flow direction in this area is poorly understood. Acid mine drainage also may be present within Waste Disposal Area A, based on observations of several barren areas along the north and west slopes with evidence of small acid seepage (none were flowing during two observation periods). This disposal area consists mainly of waste rock within which, oxidization of sulfide materials may be generating acid and mobilizing metals. Two monitoring wells are located north (BH53) and west (BH48) of the facility, but the direction of groundwater flow in this area remains uncertain.
A6. Project Description:	In a December 2013 mobilization associated with this project, 32 existing monitoring wells and 7 recently installed wells were sampled. To support the evaluation of the recently installed wells, Top-of-casing and ground surface elevation data will be obtained to enable the determination of groundwater flow directions. The locations of wells on the site are displayed in *Figure 1, Monitoring Well Locations* and the elevations of the existing wells to be used as benchmarks are displayed in *Table 1, Barite Hill Elevations*.
Applicable regulatory information, actions levels, etc.	na
Decision(s) to be made based on data:	The well elevations obtained in work described herein will be used in conjunction with previously determined elevations and static water levels to determine groundwater flow directions across the well field.
Field Study Date:	As weather and schedule permit, February 2013. The survey is expected to require one or two days of site work.

Projected Lab Completion Date:	na
Final Report Completion Date:	The results of this work are to be incorporated into the analytical results report for the sampling of the monitoring wells. No additional time is expected to be required for obtaining and processing of the elevation data.

A7. Quality Objectives and Criteria

All samples/sample locations meet the field investigation objectives and purposes summarized in Sections A5 and A6 of this QAPP.

A8. Special Training/Certifications

The surveying crew chief shall have had formal training in performing differential leveling and experience with similar surveys.

A9. Documents and Records

The final report will be prepared in accordance with the requirements of the SESD *Operating Procedure for Report Preparation and Distribution*, SESDPROC-003-R3. All field observations, measurements and sampling activities supporting the field investigation will be recorded and documented according to the SESD *Operating Procedure for Logbooks*, SESDPROC-010-R4. Project files will be maintained according to the SESD *Operating Procedure for Control of Records,* SESDPROC-002-R5.

SECTION B: Data Generation and Acquisition

B1. Sampling Design
No Analytical Samples are to be collected in the work described herein.

B2. General Procedures

This project entails only optical differential leveling. There are no SESD Quality System Procedures for this process. Differential leveling is a well understood practice and is typically taught as part of engineering and geology degree programs.

Survey loops will originate and close at previously surveyed wells or the site elevation benchmark station. It is anticipated that three or four survey loops will be performed.

B3. Sampling Handling and Custody

No samples are to be collected in this work.

B4. Analytical Methods No samples are to be collected in this work.

SESD:	na
CLP:	na
Other:	na

B5. Quality Control	
Field:	All survey loops will be closed to third order standards as established by the following formula: $Acceptable\_Closing\_Error = 0.05\sqrt{Survey\_Length\_In\_Miles}$ Survey loops not meeting this standard will be repeated.
Laboratory:	na

B6. Instrument/Equipment Testing, Inspection and Maintenance

Per SESD Procedure *SESDPROC108-R3, Equipment Inventory and Management*

B7. Instrument/Equipment Calibration and Frequency

The Sokkia SDL30 survey instrument to be used is verified to meet manufacturer specifications biannually.

B8. Inspection/Acceptance for Supplies and Consumables

All critical supplies and consumables for this field investigation are inspected and maintained in accordance with the following procedures:

SESD Operating Procedure for Purchasing of Services and Supplies, SESDPROC-015-R3.
SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108-R3.
SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011-R3.

The SESD Field Quality Manager and the Branch Quality Assurance Officers are responsible for ensuring that these requirements are met.

B9. Non-direct Measurements:

There are no non-direct measurements to be made in this project.

B10. Data Management

The field project leader will be responsible for ensuring that all requirements for data management are met. All data generated for this field investigation, whether hand-recorded or obtained using an electronic data logger will be recorded, stored and managed according to the following procedures:

SESD Operating Procedure for Control of Records, SESDPROC-002-R5.
SESD Operating Procedures for Logbooks, SESDPROC-010-R4.

SECTION C: Assessment/Oversight

C1. Assessments and Response Actions

Assessments will be conducted during the field investigation according to the *SESD Operating Procedure for Project Planning*, SESDPROC-016-R2, to ensure the QAPP is being implemented as approved. The Project Leader is responsible for all corrective actions while in the field.

C2. Reports to Management

The Project Leader will be responsible for notifying the Project Manager (Requestor) and appropriate SESD management if any circumstances arise during the field investigation that may adversely impact the quality of the data collected.

SECTION D: Data Validation and Usability

D1. Data Review, Verification, and Validation

All analytical data will be provided by the SESD Analytical Support Branch and reviewed, verified and validated in accordance with the *SESD Analytical Support Branch Laboratory Operations and Quality Assurance Manual, Feb 2012.*

All data derived from SESD field measurements will be reviewed, verified, and validated in accordance with the *SESD Operating Procedure for Report Preparation and Distribution*, SESDPROC-003-R3.

D2. Verification and Validation Methods

All analytical data will be provided by the SESD Analytical Support Branch and reviewed, verified and validated in accordance with the *SESD Analytical Support Branch Laboratory Operations and Quality Assurance Manual*, February 2012.

All data derived from SESD field measurements will be reviewed, verified, and validated in accordance with the *SESD Operating Procedure for Report Preparation and Distribution*, SESDPROC-003-R3.

D3. Reconciliation with User Requirements

The usability of all data derived from SESD field sampling and measurements conducted during this field investigation will be evaluated in accordance with the *SESD Operating Procedure for Report Preparation and Distribution*, SESDPROC-003-R3.

****Footnotes**: This Quality Assurance Project Plan (QAPP) has been prepared and approved according to the EPA *Requirements for Quality Assurance Project Plans (EPA QA/R5 EPA/240/B-01/003)*, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001(USEPA, 2001). This document will be used to ensure that the environmental data collected for this project are of the type and quality for the intended purposes. **This document is for SESD use only.**

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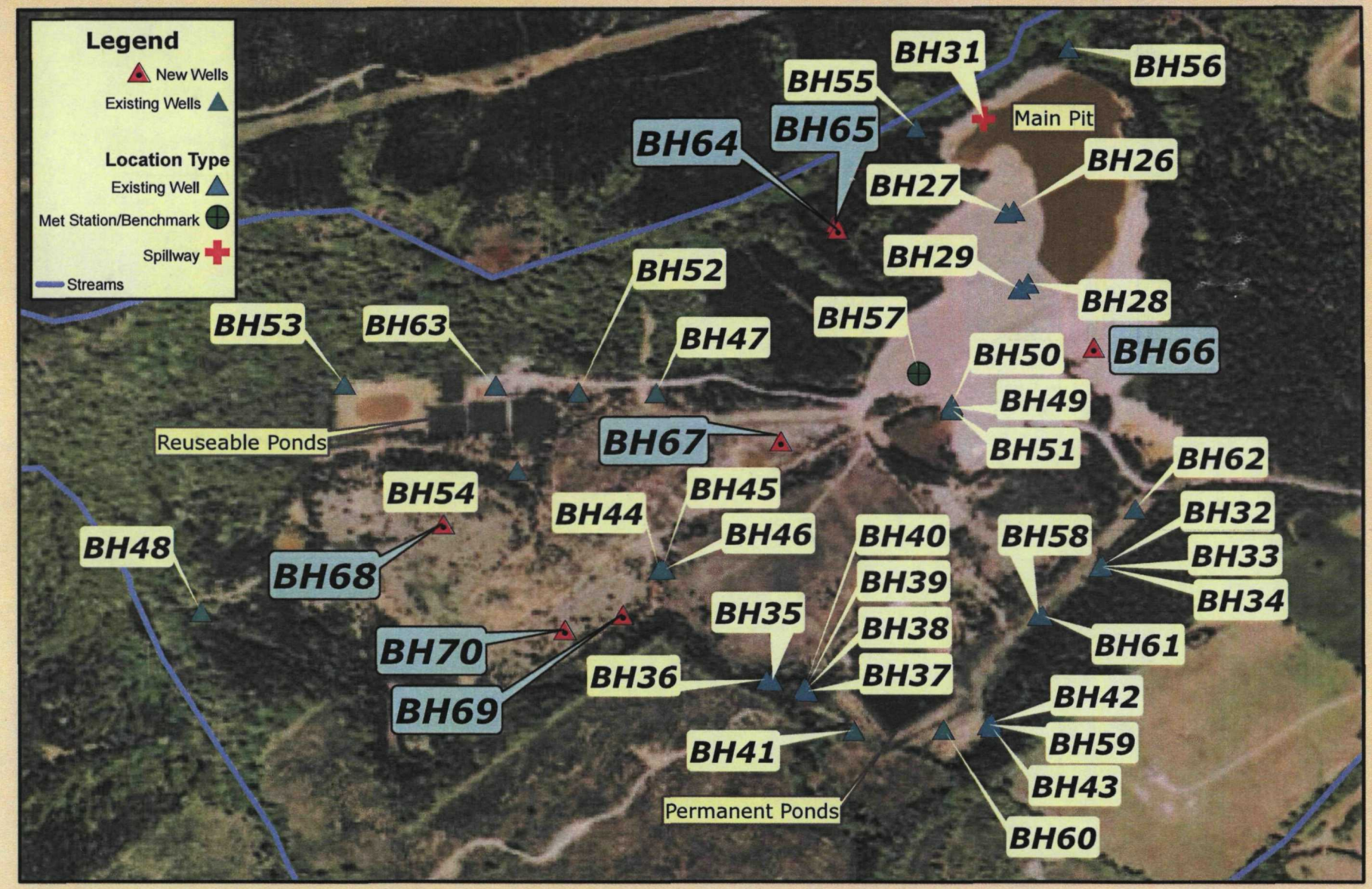
Legend
New Wells
Existing Wells
Location Type
Existing Well
Met Station/Benchmark
Spillway
Streams
BH31
BH56
BH55
BH65
Main Pit
BH64
BH26
BH27
BH29
BH52
BH28
BH53
BH63
BH47
BH57
BH50
BH66
BH49
Reuseable Ponds
BH67
BH51
BH62
BH54
BH45
BH44
BH32
BH48
BH46
BH40
BH58
BH33
BH68
BH39
BH34
BH35
BH38
BH61
BH70
BH36
BH37
BH69
BH42
BH41
BH59
BH43
Permanent Ponds
BH60
0 220 440 880 1,320
Feet
N
Barite Hill 2012 4th qtr
Monitoring Well Sampling
Figure 1. Monitoring Well Locations
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Table 1, Well Information

DART/Equis Station ID	Historical Name	Well Casing	Total Depth (ft BTOC)	Comments
BH26	INL Well 4 / BHMW-1	2" pvc	59.2	INL well #4. Good recharge.
BH27	INL Well 3 / BHMW-2	4" pvc	55.0	INL well #3. Good recharge, difficult to lower
BH28	INL Well 2 / BHMW-3	2" pvc	61.3	INL well #2. Good recharge.
BH29	INL Well 1 / BHMW-4	6" pvc	73.9	INL well #1. Good recharge.
BH32	MW-D3	2" pvc	80.3	
BH33	MW-D2	2" pvc	163.2	Poor recharge
BH34	MW-D1	2" pvc	98.9	
BH35	MW-G2	2" pvc	176.6	Poor recharge, paper towels originally found in
BH36	MW-G3	2" pvc	125.2	Obstruction at 35ft prevents low flow/low vol sampling. Multiple well volume purge and bailer used.
BH37	MW-E4	4" pvc	24.6	Well recharges poorly. Generally sampled by pumping dry and returning on subsequent days to sample.
BH38	MW-E3	2" pvc	109.1	poor recharge
BH39	MW-E2	2" pvc	173.3	poor recharge
BH40	MW-E1	2" pvc	63.4	poor recharge
BH41	MW-N	2"pvc	27.1	Well recharges very poorly. Sampled by pumping dry and returning on subsequent days to sample.
BH42	MW-C1	2"pvc	182.9	Black particles in water. Good recharge
BH43	MW-C2	2"pvc	78.2	
BH44	MW-F1	2"pvc	204.8	Poor recharge
BH45	MW-F2	2"pvc	146.2	
BH46	MW-F3	2"pvc	73.0	
BH47	MW-I	2"pvc	90.1	
BH48	GW-3	4" pvc	23.2	Poor recharge
BH49	MW-A3	2"pvc	73.9	
BH50	MW-A2	2"pvc	148.1	
BH51	MW-A1	2"pvc	199.9	
BH52	MW-J	2"pvc	64.2	Commonly dry
BH53	BHMW-5	2"pvc	90.3	
BH54	MW-H	2"pvc	62.4	Well recharges poorly. Generally sampled by pumping dry and returning on subsequent days to sample.
BH55	GW-1	4" pvc	37.4	
BH56	GW-2	4" pvc	28.5	
BH58	discovered well	2" pvc	82.1	
BH59	discovered well	4"pvc	29.7	
BH60	discovered well	2" pvc	28.6	
BH61	MW-L	2"pvc	29.3	Commonly dry
BH62	MW-M	2"pvc	28.7	Commonly dry
BH63	discovered well	2" pvc	83.0	Discovered near building at reuseable ponds.
BH64	Newly installed wells	To be recorded in this project.		Near seeps on north trib
BH65				Near seeps on north trib
BH66				South of Main Pit
BH67				West of BH49 cluster
BH68				South of Reuseable Ponds
BH69				East Rainsford Pit
BH70				West Rainsford Pit

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